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Serial No. 09/712,104
Docket No. NEC 177
Amendment C Under Rule 116

AMENDMENTS TO THE CLAIMS:

Please cancel claims 1-3, without prejudice.

This listing of claims will replace all prior versions and listings of claims in the

Application:

Claim 1-3 (canceled).

Claim 4 (withdrawn): A PLL circuit comprising:

(a) a voltage-controlled oscillator having a non-inverting input terminal and an inverting input terminal, wherein a difference voltage between terminal voltages impressed upon respective ones of the non-inverting and an inverting input terminals is input to said voltage-control led oscillator as a control voltage so that said voltage-controlled oscillator will oscillate at a frequency in accordance with this control voltage;

(b) a phase comparator comparing phase of an output signal from said voltage-controlled oscillator, or phase of an output signal obtained by frequency-dividing the output of said voltage-controlled oscillator by a frequency divider, with phase of an input signal, and outputting result of this phase comparison between the output signal and the input signal;

(c) first and second loop filters connected at output terminals thereof to the non-inverting and inverting input terminals, respectively, of said voltage-controlled oscillator; and

(d) a charge pump which includes a first circuit and a second circuit:

(d1) the first circuit, when a signal output from said phase comparator for raising the oscillation frequency of said voltage-controlled oscillator is in an active state, charging a first capacitor, that applies the terminal voltage of the output terminal of said first loop filter, by a constant current from a first constant-current source, thereby increasing the terminal voltage at the output terminal of said first loop filter, and discharging a second capacitor, that applies

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the terminal voltage of the output terminal of said second loop filter, by a constant current from a second constant-current source, thereby decreasing the terminal voltage at the output terminal of said second loop filter, whereby the difference voltage across the inverting and non-inverting input terminals of said voltage-controlled oscillator is enlarged; and

(d2) the second circuit, when a signal output from said phase comparator for lowering the oscillation frequency of said voltage-controlled oscillator is in an active state, discharging said first capacitor, that applies the terminal voltage of the output terminal of said first loop filter, by a constant current from a third constant-current source, thereby decreasing the terminal voltage at the output terminal of said first loop filter, and charging said second capacitor, that applies the terminal voltage of the output terminal of said second loop filter, by a constant current from a fourth constant-current source, thereby increasing the terminal voltage at the output terminal of said second loop filter, whereby the difference voltage across the inverting and non-inverting input terminals of said voltage-controlled oscillator is reduced.

Claim 5 (withdrawn): The PLL circuit according to claim 3, wherein said charge pump increases the terminal voltage at the output terminal of said first loop filter by charging said first capacitor by an output current from a transistor of a first conductivity type and decreases the terminal voltage at the output terminal of said second loop filter by discharging said second capacitor by an output current from a transistor of a second conductivity type that is opposite the first conductivity type; and

 said charge pump increases the terminal voltage at the output terminal of said second loop filter by charging said second capacitor by an output current from a transistor of the first conductivity type and decreases the terminal voltage at the output terminal of said first loop

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filter by discharging said first capacitor by an output current from a transistor of the second conductivity type.

Claim 6 (withdrawn): A PLL circuit comprising:

(a) a voltage-controlled oscillator having a non-inverting input terminal and an inverting input terminal, wherein a difference voltage between terminal voltages impressed upon respective ones of the non-inverting and an inverting input terminals is input to said voltage-controlled oscillator as a control voltage so that said voltage-controlled oscillator will oscillate at a frequency in accordance with this control voltage;

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